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ABSTRACT

The impact of predicted technological developments on educational broadcasting depends on the long range planning done to exploit them. It is expected that in the future computers will be used extensively by broadcasting agencies to collect, analyze, and provide, on call, a wide range of data about audience groupings. Determination cf program goals will be affected by technological developments that will allow geographically dispersed people and agencies to participate in this aspect of programing. Information about program resources will be made available through an index or storage bank. Computers will also facilitate cost effectiveness accounting. New audio and video storage devices and techniques will affect the production and assembly of programs. The new technologies will have the most profound effect on program transmission and distribution, making possible the satisfaction of a wider variety of instructional, informational, and cultural purposes. New devices for distribution and playback will make it possible for schools to retrieve instructional materials at times of greatest convenience. It is most important that in the planning stage, educational broadcasting interests be granted respect and a sizeable increase in their role. (MF)

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REPORT OF THE BOARD COMMITTEE ON LONG RANGE PLANNING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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SUMMARY

In the attached paper, the Committee on Long Range Planning of the NAEB explores the impact of certain, predicted technological developments on the operation and management of educational broadcasting efforts.

The new devices, which range from audio-video program playback units through continent-spanning satellite relay systems, are examined against the potential of their improving the efficiency of our social and instructional services. Educational broadcasting is analyzed as a process - the several, inter-related aspects of which are dependent on, or increasingly assisted by, mediating apparatus of one sort or another.

Consideration is given significant policy issues which may arise in consequence of the changes forecast. The intent of the document is to call attention to the manifest need for rationalized, institutional and professional planning in order to exploit the new technologies most advantageously.

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IMPACT OF NEW TECHNICAL DEVELOPMENTS ON EDUCATIONAL BROADCASTING

There is something inherent in discussions of long range planning that seems disrespectful of the immediate and urgent problems of the day. It is tempting, therefore, to let the morrow take care of itself.

Yet there is the feeling occasionally that at least some of today's troubles might have been avoided and that what is still potential might already be real, if today's development were part of an overall projection rather than the consequence of ad hoc and often expedient decisions. It is such a projection, examining in a positive frame of reference various developing technologies, that we have sought to provide through the work of this Committee. We have not restricted the examination to entirely new developments, but have recognized as well important variations or extensions of currently available technology.

What we have projected is not so much a prediction as it is an effort to describe what developing electronic communication technologies and techniques can make it possible to do. By their very nature, such projections assume that we have not reached the end of the line in technical development and that what we call "broadcasting" today may operate through quite different technical arrangements in the future and with much greater flexibility and efficiency than we can manage today.

It is already possible to identify some changes, especially if one thinks of educational broadcasting as a function and process, and not only as an

industry or set of facilities. Cable communication systems, remote control of video tape recorders, and the imminent use of satellites for interconnection distort the neatness of the simple one-way communication system operated in areas no greater than the coverage possible through standard television and radio broadcasting. When today's facilities have been replaced and gone to rust the function of using electronic communication for reaching people individually or en masse will persist. Can we be prepared for these changes? Can we have an impact upon what they will be?

It is the central assumption of this report that the impact of new technology upon educational broadcasting will be determined in great measure by educational broadcasting's ability to embrace and exploit new technology. The way in which the technology affects our work, and vice versa, depends on the quality and timeliness of our own actions. Our policy will reflect the technology if we allow the technology to influence our policies.

The alternative is to inherit the technical systems and priorities established for and by others, for other purposes and with other motives. If educational broadcasting in all its public and instructional forms is to carry forward distinctive services then an attempt must be made to formulate policies to help shape technological developments along directions and dimensions favorable to providing such services.

We have elected, therefore, to accept as our primary objective a rational exploration of how certain predicted and significant technological developments may affect and modify both the professional activity and social consequence of educational broadcasting.

The technological forms that we have considered fall into two general categories:

1) DIRECT MEDIA - devices along with materials for producing/reproducing and storing/distributing aural and visual symbols for, and to, audiences;

2) ANALYTICAL MEDIA - highly specialized media systems that are capable of subjecting information to comparisons, rankings or other analyses in order to make it useful in accomplishing some specified task or in controlling the sequence, rate and content of other media.

Professional activity by practitioners in our field has been viewed as involving, at its center, the organized management of a comprehensive communications process having several, inter-relating elements:

a) the formulation of objectives;

b) the design of appropriate materials;

c) the production or assembly of such materials;

d) the distribution (transmission) of such materials through space, time or time/space;

e) the reception (and reproduction) of such materials at desired points;

f) the evaluation of the outcomes, with an eye to improving the efficiency of subsequent materials.

It has been our belief that the significance of all technological developments in broadcasting should be examined against these elements, inasmuch as the communications/cybernetic developments in question will become means for their accomplishment.

Objectives Formulation

The principal tasks connected with this primary element of the educational broadcasting process are of two kinds: analyzing audience needs and characteristics then determining the specific audience responses desired to result from particular programming efforts.

Communications technologies have played only a marginal role in the full-scale execution of these important operations in the past. A great change can be foreseen, however. In the future, we believe that computers and data-processing devices of various kinds will be used extensively by national, regional and local broadcasting agencies to collect, analyze, and provide, on call, a wide range of research data about audience groupings, according to their socio-economic, psychological and other such descriptive characteristics. These statistical and other data will be relied on in assessing the various social and instructional deficits for which programming should be undertaken.

The continuing high cost of such machinery will be off-set by improved techniques for institutional "time-sharing," even across great distances and beyond conventional administrative/political boundaries. Data will probably be routinely collected and then shared by a variety of different public and private agencies having social responsibilities and functions that require precise specification of population groups.* Outputs can be expected to vary according to the individual demands of the subscribing agencies.

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*Such developments should not proceed without due consideration for deliberate or inadvertent invasions of privacy.

Because of the complexities of our own organizational patterns, it will probably be sensible for certain regional and national institutions (e. g., regional networks, NAEB, NET, NERN, CPB, NPTL, and instructional television and radio libraries) to establish composite data systems which interface with the aforementioned consortia schemes as well as with each other. Such inter-locking computer arrangements would allow program planning and distribution at national, regional and local levels to be carried forward against appropriately uniform audience specifications, which could result both in savings and increased effectiveness.

From an operational standpoint, the introduction of these analytical media techniques will necessitate the acquisition of certain machine and interpretive skills by broadcasting personnel responsible for audience analysis, needs assessment and program planning. In larger institutions, it may require the addition of special staff members charged with operating the computer programs and/or equipment.

The actual determining of program goals will be directly affected by technological development in the local, regional and national settings. An intensified use of teletype, facsimile and wide-area-rate telephone equipment by educational broadcasters will allow geographically dispersed people and agencies to participate functionally and actively in this vital aspect of programming. Consequently, delegation of program planning responsibility will be very much broadened, but without the enervating delays and protocols of the past.

Design and Production of Programs

Once audience objectives have been spelled out for a programming effort, planning usually moves on to an identification and assessment of those resources available: talent, production facilities, transmission schedule openings, utilization channels and the like. For the most part, this programming step in past has been executed very informally, with little or no technological involvement. We foresee a gradual change, especially in the larger broadcasting centers.*

Resource data of all kinds will be stored, analyzed and "refreshed" on a fairly systematic basis, so that planners will be able to call out specific facts about programming input possibilities when needed. Stations through regional or national organizations will have access to an index of information about the sources of such elements as content and technical expertise, on-air performance skills, scenic design goods, and existing auditory and cinematic materials. Data about previous programming projects having similar objectives and methodologies will also be available for comparative analysis.

Certain national organizations may find it desirable to set up special "storage banks" of information about specific categories of program resources. The "Educational Media Index" of the past decade gives a hint of the valuable resource-locating techniques to be made possible through use of shared-time computers.

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*The highly sophisticated Total On-Live Program Information Control System, installed last fall by NHK, Tokyo, is an example of how such a plan can be used to operate efficiently the complete technical, programming, and management aspects of a vast and complicated organization.

We foresee that computer machinery will facilitate another important development in this critical phase of program planning: cost effectiveness accounting. Increasingly, the various complex cost structures of all programming projects will be carefully analyzed as operational aspects in the general introduction of more rigorous fiscal management procedures by which educational broadcasting can direct itself toward the not only admirable but also essential goal of "doing (progressively) more with (relatively) less."

The actual production and assembly of programs will be increasingly affected by the development of new audio and video storage devices and techniques. Aural and visual program components of various kinds will be easily available to producers in new electronic forms having electronic audio, photographic or holographic cartridge-type storage capacities.* (The CBS-EVR, RCA-SelectaVision, and audio-casette systems are notable examples.) It is possible to predict that in larger centers, the control room may actually have "dial-access" to a considerable collection of indexed audiovisual elements so that frequently needed photographs, film clips, pronunciation demonstrations, etc. can be electronically inserted into programming without the current, clumsy, manual assembly now required. These same new devices will also allow programmers easily to subject these materials to such presentational requirements as stop-frame, slow-motion, reverse and monochrome/color frame-splitting.

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*The NAEB is currently undertaking a detailed study of these developments.

The yoking of facsimile devices to television and radio techniques will allow valuable multi-media design strategies having print components to be executed more flexibly, quickly and efficiently than has been possible with the current land-delivery methods. This will be especially true for instructional operations.

Program Transmission and Distribution

It is in this phase of the educational broadcasting process that we see the most profound impact on new technologies.

In past, educational broadcasting institutions have depended on, indeed, been defined by, wireless radiation of an extremely limited number of simultaneous programs to a mass of consumer-controlled receivers. The low-unit cost and relative technical ease of the instantaneous mass replication of such signals have been seen as sufficient social advantages to off-set the sharp limitation in the number of different signals simultaneously possible. Moreover, the economics of our undertakings have customarily been pivoted around the presumption that the relatively smaller audiences which could reasonably be collected for each program in a multi-signal service would not justify the expense.

The fact is that, until fairly recently, spectrum limitations effectively rendered the whole question academic. More often than not, greater program diversification was made physically impossible because real-time wireless transmission channels were in short supply. Supporting arguments about the prevailing economics, while undoubtedly appropriate for commercial UHF

broadcasters, seem in retrospect also to have precluded the educators from recognition that multiple services were not only marginally desirable but critically essential if our institutions were really to meet all the manifest and urgent demands for educational communication.

The new transmission/distribution technologies that have been developed or prefected recently can - and unquestionably will - bring a rapid change to our institutional behavior. Our transmission/distribution capacities will be enormously expanded by the utilization of a number of different new devices* and techniques, including:

1) wireless systems: 2500 mHz, satellite relay, laser transmission, FM multiplexing; CADAVRS;
2) wired systems: CATV, cluster rediffusion, electro-writer,** blackboard-by-wire,** telelecture,** slow-scan television;**
3) storage systems: EVR, SelectaVision, cartridge-loading video-tape recorders, cassette and loop-cartridge audio-recorders, phonovid discs;
4) print-out systems (wired and wireless): Edufax.

Adoption of these sending systems will have the effect of multiplying the stimulus to program productivity many times over.

No longer will we tend to think institutionally in terms of "stations," but instead, we will identify ourselves as public educational communications

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*Note glossary, following page 16.

**These techniques could, in special circumstances, be carried out through wireless systems, although their general operation is conducted through wired or special "closed-circuit" wireless systems.

agencies, each organized around different but inter-related transmission means and modes. We will dedicate this enhanced capacity to extend programs to an even wider variety of instructional, informational and cultural purposes. And in so doing we will engage our operations even more intimately with a broader spectrum of community forces and institutions.

We believe that educational broadcasting organizations should begin immediately to bring these new transmission and distribution technologies under their exploitable direction or, where that is not preferable or feasible, into an appropriate relationship for efficient utility.

Reception

Transmission and reception (or distribution and play-back) are different aspects of the same technological phenomena. Institutional adoption of the new device systems enumerated in the preceding section obviously will mandate a corresponding consumer acceptance if communications contacts are to succeed. It must be observed that the contrary can also be correct. Strong consumer demand for the convenience (or novelty) of a new reception/playback mechanism could effectively necessitate introduction of the associated transmission/distribution equipment by program suppliers anxious to intensify audience contacts by whatever available means.

The exact give-and-take of this marketing process is very difficult to predict. Educational broadcasters will be obligated to study audience interest patterns on a continuous basis in order to determine the critical levels of consumer potential for particular, new device systems. At the same time,

we must try to stimulate consumer potential for those new devices which would assist in expanding our audiences and effectiveness. A passive wait-and-see attitude could lead to the commercial proliferation of some new system which might operate rather adversely to the economic and social demands of educational broadcasting institutions (as, for example, a cable television system with very limited channel capacities for educational purposes).

One direct technological development in this category of our study will involve the perfection of various devices for activating audio-video reception and recording apparatus through time or across distance. Clock-controlled recorders located in school districts or buildings could enormously increase the capacity of existing and future real-time transmission systems by allowing emission and storage of programs overnight, on weekends or at other normally down hours.* More sophisticated schemes like CADAVRS can provide programming for particular consumers by means of remote recorder activation from signals coded by the sender. Dial-access play-back facilities - operating over long distance - may come to have similar value for the on-call retrieval of instructional or other materials at times of greatest convenience for schools, teachers, etc.

Audience Evaluation

While our concern about the audience for educational broadcasting suggests we have always seen the use of radio and television as a cyclical process,

*Such arrangements are already underway in Illinois.

the essential feedback step when undertaken at all has often been conducted with imprecision and inefficiency. This is not altogether because we have failed to recognize the absolute necessity for rapid, accurate and valid data about program outcomes. The situation has resulted from the sluggish, burdensome and exorbitantly expensive character of the largely manual techniques which we have had for collecting and analyzing audience responses. Compromises of one kind or another have usually been found unavoidable, or at least tolerable, even if the resultant feed-back information has been tainted by factors of inaccuracy, unreliability and invalidity.

We are now on the threshold of substantial changes in this deplorable situation. Computer and data-processing machinery is available to provide quick analysis of the audience data collected. Even more importantly, new low-cost telemetry techniques associated with the operation of these machines can allow sample information to be rapidly and uniformly fed to or from numerous geographically dispersed sources without the long delays of the past. The detail of audience studies can also be considerably elaborated so that we no longer have to be content with overly simple evidence about highly complicated social behaviors.

Another aspect of this issue can be seen in the development of those transmission/distribution systems which can allow an extremely easy tallying of the gross circulation of particular programs. The new play-back devices (e. g., EVR, SelectaVision, etc.) require consumers to select, accept or buy individual programs. Reasonable inferences about consumer use made

from the resultant patterns of distribution might have a considerable value for the program producers involved. The new cable transmission system sometimes termed "cluster rediffusion" also offers an exceptional advantage to the audience researcher. Readings of the relative line voltage figures for the various channels in the feeder system can automatically yield corresponding "tune-in" consumption data of high accuracy.

Additional Policy Implications

Certain policy questions have already been raised in our discussion of technological developments. There are others which require mention.

The program and operational benefits that we have noted for educational broadcasting will be beneficial to other communication interests as well. But the benefits to each will be available to all only if means are found to establish communication authorities and educational entities that can cooperate effectively in the management and use of the new techologies.

Therefore, we believe our institutions should engage with others in cooperative planning and development of broad-scale community, regional and national facilities to serve the whole spectrum of socially needful interests. From this kind of cooperation may well emerge across the country a number of variant but complementary "multi-systems" for providing a wealth of essential communications services to all those who can benefit from them.

There is a caveat to all this, however. Cooperation in an enterprise of such vast and historic dimension should constitute rational negotiations between respectful peers. The greater good cannot come from communications

planning in which the public and educational parties, with the high social priorities of their many tasks, are kept in secondary or lesser roles simply out of custom. We cannot allow joint planning to proceed from untested assumptions about "equitable" allocations ratios that do not very considerably expand our present programming capacities. On the ethical basis of the enlarging proportions of our urgent social and educational duties, we must plead for and insist on sizeable increases without any consistent reference to the "relative" increases afforded various other communications interests. Our job cannot be defined by the others, nor our technological capacities established by some artificial ratio to the differently based resources of others. What is truly equitable is what best meets the demands of all the American people for a total communications service. Past forms, traditions, and relationships must not inhibit us. We must innovate, as must all the other parties.

A second area of policy issue arises from the new relationships between our national, regional and local educational broadcasting institutions. In the past and still at present, there were distinct differences between programs prepared and circulated from these separate levels, not only in terms of quality and cost, but also with respect to the focus of their objectives and contents.

We predict that these same distinctions between, say, network-originated programs and those done purely for local consumption will continue, with a special new emphasis made possible by adequate funding of the Corporation for Public Broadcasting. Nevertheless, we foresee that innovating

technologies, and the policies surrounding them, may well lead to new kinds of "national" and "regional" programs which conform to the dominant, highly specialized characteristics of what have heretofore been considered as "local" efforts. This would result from: 1) our improved capacities to specify audience groups by demography, entry behaviors and social/personal deficits; 2) our enhanced abilities to accomplish practical program planning and production by geographically-dispersed persons and agencies; and 3) our strikingly increased capacity in program distribution and transmission to individuals and institutions. This kind of programming phenomenon would allow many separated and fragmentary local audience groups of common characteristics and needs to receive especially-devised materials prepared and transmitted/distributed on a nation-wide or regional basis. Such efforts in the past, even with their economic advantages, have been virtually impossible to implement for the myriad of practical problems we all know.

In order to nourish this potentiality, educational broadcasters must begin to formulate policies which will stimulate wide-scale cooperative programming enterprises. The present national and regional groupings, while highly useful to other programming ends, may be inadequate for conducting the specialized affairs of this sort of program development and circulation.

In regarding all the exhilarating potentials of technological change in educational broadcasting, it is advisable to keep in mind that technical innovations themselves will have but little constructive impact on our ways of doing things unless we are imaginative, resourceful and skillful in applying

them to the efficient execution of our ethical responsibilities. The very marvel we may feel toward the new machines, materials and techniques may induce us into a trance of ineffectual optimism. We must be careful that when confronted with the opportunity to take a giant step forward, we do not merely stand back in awe.

GLOSSARY OF NEW TECHNOLOGIES

(in order listed on page 9)

2500 MHz systems - relatively low-powered radiating (or beamed) line-of-sight transmission of up to four simultaneous audio-video programs to special receivers placed throughout a coverage area extending about 10-15 miles from the sending antenna.

Satellite relay - transmission by specially orbited satellites of one or more audio-video programs over distances of many thousands of miles to ground stations and thence into other distribution systems or to specialized antenna-receiver arrays at schools, training centers, homes, etc.

Laser transmission - use of line-of-sight, highly concentrated light sources to project modulated audio-video signals in point-to-point relay systems.

FM multiplexing - emission of up to five simultaneous programs by a single FM radio transmission station. One signal is consistently available on conventional FM receivers; the other four may be tuned-in through relatively simple antenna-tuner arrays in schools, offices, plants, etc.

CADAVRS (Computer Assisted Dial Access Video Retrieval Systems) - a technique for the remote activation of VTR machines from wireless signals coded for particular program consumers and transmitted by ETV stations. (An experimental use is now underway at the Minnesota ETV Network.)

CATV - simultaneous "R-F" transmission of multiple audio-video signals over coaxial cables directly from distribution amplifiers to conventional receivers. Programs may be inserted from "outside" transmission sources or from production/recording facilities maintained at the central distribution point.

Cluster rediffusion - cabled transmission of single "high-fidelity" audio-video signals to homes, schools, offices, etc. from numerous neighborhood distribution "relays," all of which are connected by coaxial cables to a "master program source" facility. The central facility can send a variety of different, simultaneous programs to each neighborhood "relay." The programs can be dial selected, one at a time, for display on any "wired-in" monitor. (Conventional receivers can be used by disabling the tuning sections.)

Electro-writer - distribution of static video displays by ordinary telephone circuits. The displays, of very high contrast flat materials on a special tube face, can be projected onto a large screen. They are susceptible to change at intervals of a few seconds, too long to provide the phenomenon of "apparent motion." The visual displays can be accompanied by locally amplified audio presentations also distributed through routine telephone circuitry.

Blackboard-by-wire - a visual display system closely akin to Electro-writer.

Telelecture - distribution of "two-way" audio by ordinary telephone circuits. The signals at one end are usually amplified, although the signals at all connected points may be so treated if desired.

Slow-scan television - a system akin to Electro-writer except that the displays on conventional TV screens may be of two or three dimensional materials of wide contrast.

Electronic Video Recording (EVR) - a system developed by CBS for playing back audio-video programs through conventional TV receivers. The programs are factory-inserted onto small, sprocketless movie film cartridges which must be played through a miniaturized "flying spot scanner" mechanism attached to the receiver. The system may also be used to feed multiple sets or to provide video input to television program productions.

SelectaVision (SV) - a television playback system developed by RCA and somewhat akin to the EVR, except that the holographed audio-video signals are factory-embossed on a cartridged vinyl ribbon which passes through a low-power laser beam in the small play-back unit attached to a standard TV receiver.

Cartridge Videotape Recorders - conventional recording and replay of audio-video signals on electromagnetic tape arranged in cartridge formats which do not require threading of the tape itself.

Cassette and Loop-cartridge audio-recorders - arrangement of electromagnetic audiotape in a cartridge format which does not require tape-threading prior to recording or playback of programs.

Phono-vid discs - a conventional-format microgroove recording disc used on a special turntable-amplifier device to reproduce audio-video signals on a conventional TV receiver. The static video signals conform to the slow-scan display technique, i. e., without "apparent motion."

Edufax - the transmission of flat-graphic materials for paper print-out from a facsimile device attached to conventional TV sets. The facsimile signals are in effect "carried" inside regular television emissions.